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PCT

PCT Application
PCT/JP2002/013643



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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|--|--|---|
| Applicant's or agent's file reference DP-907PCT | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No. PCT/JP2002/013643 | International filing date (day/month/year) 26 December 2002 (26.12.2002) | Priority date (day/month/year) 28 December 2001 (28.12.2001) |
| International Patent Classification (IPC) or national classification and IPC H01M 4/02, 4/58, 4/38, 10/40 | | |
| Applicant NEC CORPORATION | | |

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 4 sheets, including this cover sheet.
☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 1 sheets.

- This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

| | |
|---|--|
| Date of submission of the demand 26 December 2002 (26.12.2002) | Date of completion of this report 02 December 2003 (02.12.2003) |
| Name and mailing address of the IPEA/JP | Authorized officer |
| Facsimile No. | Telephone No. |

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/JP2002/013643

I. Basis of the report

1. With regard to the elements of the international application:*

- ☐ the international application as originally filed
- ☒ the description:
 pages 1-29, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☒ the claims:
 pages 1-8, 10-13, as originally filed
 pages _____, as amended (together with any statement under Article 19
 pages _____, filed with the demand
 pages 9, filed with the letter of 30 June 2003 (30.06.2003)
- ☒ the drawings:
 pages 1-6, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
 pages _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/JP02/13643

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|-------------------------------|--------|-----------|-----|
| Novelty (N) | Claims | 1-13 | YES |
| | Claims | | NO |
| Inventive step (IS) | Claims | 3, 9-13 | YES |
| | Claims | 1, 2, 4-8 | NO |
| Industrial applicability (IA) | Claims | 1-13 | YES |
| | Claims | | NO |

2. Citations and explanations

Document 1: JP, 2001-283833, A (SANYO ELECTRIC CO., LTD.), 12 October 2001

Document 2: JP, 11-288705, A (TOYOTA MOTOR CORPORATION), 10 October 1999

Document 3: JP, 07-235330, A (SONY CORPORATION), 05 September 1995

The subject matter of claims 1 and 4-8 does not involve an inventive step on account of document 1 cited in the ISR. Document 1 describes a lithium-ion secondary battery that uses a negative electrode provided with a first active substance layer consisting of carbon on a collector and provided with a second active substance layer consisting of a Si or other metal or semiconductor alloyed with Li. thereon. Also, the effects of the invention are described as exhibiting high discharge capacity and charge/discharge efficiency, preventing peeling of the active substance from the collector, and being able to achieve excellent cycle characteristics. Therefore in the invention described in document 1, in order to provide a battery with both high energy density and excellent cycle characteristics, setting the negative electrode so as to realize optimum effects and the extent to which to use it could easily be conceived by a person skilled in the art. Also, claims 1 and 4-8 of the present application express only the lithium content of the second layer in a state of 100% depth of discharge when used. They do not indicate a battery designed so as to achieve this sort of lithium content or a manufacturing method therefor. This state could be obtained in the invention described in document 1 also, so there is no distinctive feature as a physical invention.

The subject matter of claim 2 does not involve an inventive step on account of documents 1-3 cited in the ISR. Documents 2 and 3 describe doping the negative electrode in advance with lithium equivalent to an irreversible capacity amount in order to obtain a lithium-ion secondary battery with high capacity and excellent cycle characteristics. Therefore, in the invention described in document 1, in order to provide a battery with both high energy density and excellent cycle characteristics, employing the lithium doping means described in documents 2 and 3 and the extent to which to make the negative electrode capacity greater than the positive electrode capacity could easily be conceived by a person skilled in the art.

The subject matter of claims 3 and 9-13 is novel and has an inventive step. In a lithium-ion secondary battery, designing the amount of lithium so as to satisfy equations (1) and (2) described in claim 3, using a lithium content in the negative electrode's second layer so that it is 31~67 atomic-% after completion of discharge, and a manufacturing method that includes the step of adding lithium in a capacity that satisfies equations (A)~(D) described in claim 13 are not described in any of the documents cited in the ISR and appear to be non-obvious to a person skilled in the art.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
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VI. Certain documents cited

1. Certain published documents (Rule 70.10)

| <u>Application No. Patent No.</u> | <u>Publication date (day/month/year)</u> | <u>Filing date (day/month/year)</u> | <u>Priority date (valid claim) (day/month/year)</u> |
|---------------------------------------|--|---|---|
| JP 2002-015729 A | 18. 01. 02 | 30. 06. 00 | |
| [E X] | | | |

2. Non-written disclosures (Rule 70.9)

| <u>Kind of non-written disclosure</u> | <u>Date of non-written disclosure (day/month/year)</u> | <u>Date of written disclosure referring to non-written disclosure (day/month/year)</u> |
|---------------------------------------|--|--|
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